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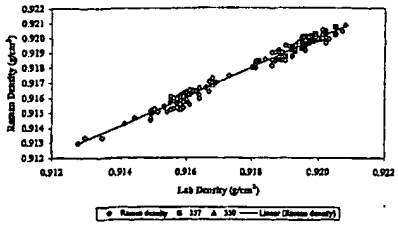
(54) Title: ON-LINE MEASUREMENT AND CONTROL OF POLYMER PROPERTIES BY RAMAN SPECTROSCOPY



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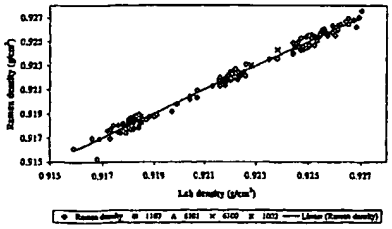

B

(57) Abstract: Methods are provided for determining and controlling polymer properties on-line in a polymerization reactor system, such as a fluidized bed reactor. The methods include obtaining a regression model for determining a polymer property, the regression model including principal component loadings and principal component scores, acquiring a Raman spectrum of a polyolefin sample comprising polyolefin, calculating a new principal component score from at least a portion of the Raman spectrum and the principal component loadings, and calculating the polymer property by applying the new principal component score to the regression model. The property can be controlled by adjusting at least one polymerization parameter based on the calculated polymer property.

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Minimum documentation searched (classification system followed by classification symbols)
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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data, PAJ, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 01/09203 A (EXXON CHEMICAL PATENTS INC) 8 February 2001 (2001-02-08)	1-48
Y	page 3, line 10 - line 20 page 4, line 11 - line 23 page 7, line 18 - line 26 page 18, line 20 - line 28	1-48
Y	US 6 144 897 A (SELLIERS JACQUES DE) 7 November 2000 (2000-11-07) column 11, line 8 - line 36; claims	1-48
Y	EP 0 257 316 A (UNION CARBIDE CORP) 2 March 1988 (1988-03-02) claims	1-48
Y	WO 98/08066 A (EASTMAN CHEM CO) 26 February 1998 (1998-02-26) claim 1	1-48

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
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Name and mailing address of the ISA	Authorized officer
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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	ARDELL G G ET AL: "MODEL PREDICTION FOR REACTOR CONTROL" CHEMICAL ENGINEERING PROGRESS, AMERICAN INSTITUTE OF CHEMICAL ENGINEERS,, US, vol. 79, no. 6, 1 June 1983 (1983-06-01), pages 77-83, XP000600528 ISSN: 0360-7275 the whole document	1-48
A	US 5 151 474 A (CHAUVEL JR JEAN P ET AL) 29 September 1992 (1992-09-29) column 4, line 3 - line 56	1-48
A	EP 0 561 078 A (ROHM & HAAS) 22 September 1993 (1993-09-22) page 6, line 31 - line 58; claims	1-48
L	WO 2004/063234 A (EXXONMOBIL CHEMICAL PATENTS INC; MARROW, DAVID, G; COCHRAN, ANDREW, M;) 29 July 2004 (2004-07-29) the whole document	1-48

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 0109203 A	08-02-2001	BR 0012874 A	09-04-2002
		CA 2381567 A1	08-02-2001
		EP 1214362 A1	19-06-2002
		EP 1214363 A1	19-06-2002
		WO 0109201 A1	08-02-2001
		WO 0109203 A1	08-02-2001
		US 2002156205 A1	24-10-2002
US 6144897 A	07-11-2000	BE 1009406 A3	04-03-1997
		AT 177761 T	15-04-1999
		AU 704563 B2	29-04-1999
		AU 6124696 A	09-01-1997
		BR 9609240 A	11-05-1999
		CA 2220316 A1	27-12-1996
		CN 1192222 A ,C	02-09-1998
		CZ 9703985 A3	18-03-1998
		DE 69601794 D1	22-04-1999
		DE 69601794 T2	07-10-1999
		EA 343 B1	29-04-1999
		WO 9641822 A1	27-12-1996
		EP 0830394 A1	25-03-1998
		ES 2131945 T3	01-08-1999
		HU 9803021 A2	28-04-1999
		JP 2000500060 T	11-01-2000
		NO 975780 A	06-02-1998
		PL 323911 A1	27-04-1998
EP 0257316 A	02-03-1988	US 4956426 A	11-09-1990
		AT 59191 T	15-01-1991
		CA 1296136 C	18-02-1992
		DE 3766775 D1	31-01-1991
		EP 0257316 A1	02-03-1988
		GR 3001318 T3	31-08-1992
		JP 63035612 A	16-02-1988
WO 9808066 A	26-02-1998	WO 9808066 A1	26-02-1998
		AU 6956096 A	06-03-1998
		BR 9612735 A	24-08-1999
		CA 2263850 A1	26-02-1998
		DE 69634270 D1	03-03-2005
		EP 0920608 A1	09-06-1999
		JP 2000516342 T	05-12-2000
US 5151474 A	29-09-1992	NONE	
EP 0561078 A	22-09-1993	AT 152133 T	15-05-1997
		AU 662159 B2	24-08-1995
		AU 2712392 A	23-09-1993
		BR 9203648 A	28-09-1993
		BR 9204219 A	28-09-1993
		CA 2077835 A1	21-09-1993
		CA 2081139 A1	21-09-1993
		CZ 9202846 A3	16-02-1994
		CZ 9203191 A3	19-01-1994
		DE 69219310 D1	28-05-1997
		DE 69219310 T2	11-12-1997
		EP 0569639 A1	18-11-1993
		EP 0561078 A2	22-09-1993

INTERNATIONAL SEARCH REPORT

International Application No
PCT/US 03/14565

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0561078 A		FI 923809 A	21-09-1993
		FI 924730 A	21-09-1993
		HR 921143 A1	30-04-1995
		HU 72025 A2	28-03-1996
		HU 66336 A2	28-11-1994
		JP 5287028 A	02-11-1993
		JP 3354974 B2	09-12-2002
		JP 5287002 A	02-11-1993
		LT 179 A	25-11-1994
		LV 10295 A	20-10-1994
		LV 10113 A ,B	10-05-1994
		MA 22828 A1	01-10-1993
		MA 22829 A1	01-10-1993
		NO 923342 A	21-09-1993
		NO 924031 A	21-09-1993
		NZ 244082 A	27-01-1995
		PL 295889 A1	04-10-1993
		RO 112357 B1	29-08-1997
		RU 2119924 C1	10-10-1998
		SI 9200219 A	31-03-1994
		SI 9200264 A	30-09-1993
		TR 26692 A	15-05-1995
		ZA 9206534 A	20-09-1993
		ZA 9208210 A	26-09-1994
		AU 2127292 A	19-08-1993
		LT 186 A	15-07-1994
		MX 9205265 A1	31-01-1994
		AU 662931 B2	21-09-1995
		MX 9206246 A1	31-03-1994
		PL 296371 A1	07-03-1994
WO 2004063234 A	29-07-2004	AU 2003302739 A1	10-08-2004
		WO 2004063234 A1	29-07-2004
		US 2004133364 A1	08-07-2004